

CALIBRATION STANDARD SPECIFICATION

FOR A

PULSE GENERATOR

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PROCUREMENT PACKAGE

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PULSE GENERATOR

1. SCOPE

1.1 Scope. This specification defines the mechanical, electrical, and electronic characteristics for a Pulse Generator. This equipment is intended to be used by Navy personnel in shipboard and shore based laboratories to calibrate various Weapon Test Sets and associated Test and Monitoring Systems (TAMS). For the purposes of this specification, the Pulse Generator shall be referred to as the PG.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment, General Specification for," and all documents referenced therein of the issues in effect on the date of the solicitation shall form a part of this specification.

3. REQUIREMENTS

3.1 General. The PG shall conform to Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased use as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The PG shall operate from a source of 103.5V to 126.5V at 50 and 60 Hz \pm 5% single-phase input power as specified in MIL-T-28800.

3.1.2.1 Fuses or Circuit Breakers. Fuses or circuit breakers shall be provided. If circuit breakers are used, both sides of the power source shall be automatically disconnected from the equipment in the event of excessive current. If fuses are used, only the line side of the input power line as defined by MIL-C-28777, shall be fused. Fuses or circuit breakers shall be readily accessible.

3.1.2.2 Power Connection. The requirements for power source connections shall be in accordance with MIL-T-28800 with a 6-foot minimum length cord.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 17 inches in width, 8 inches in height, and 21 inches in depth. The weight shall not exceed 50 pounds.

3.1.4 Lithium Batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The PG shall meet the environmental requirements for Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The PG shall meet the conditions below:

	<u>Temperature (°C)</u>	<u>Relative Humidity (%)</u>
Operating	10 to 30	95
	30 to 40	75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE03, CS01, CS02, CS06, RE01, RE02 (14 kHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The PG shall have a 85% or greater probability of remaining within tolerances on all specifications at the end of a 36 month period.

3.4 Maintainability. The PG shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 60 minutes.

3.5 Performance Requirements. The PG shall provide the following capability as specified below. Unless otherwise indicated, all specifications shall be met following a 30 minute warm-up period.

3.5.1 Pulse Period. The PG pulse period shall be at least from 500 ns to 100 ms range.

3.5.1.1 Pulse Uncertainty. The PG uncertainty shall not exceed $\pm 5\%$ of programmed value ± 2 ns.

3.5.1.2 Resolution. The period resolution shall be at least 3 digits.

3.5.1.3 Maximum Jitter. The pulse jitter shall not exceed 0.2% of programmed value + 100ps.

3.5.2 Pulse Width. The PG pulse width shall be at least from 100 ns to 1ms.

3.5.2.1 Pulse Width Uncertainty. The pulse width uncertainty of the PG shall not exceed $\pm 5\%$ of programmed value ± 2 ns.

3.5.2.2 Resolution. The pulse width resolution shall be at least 3 digits.

3.5.2.3 Maximum Jitter. The pulse width jitter shall not exceed 0.2% of programmed value + 100ps.

3.5.3 Pulse Delay. The PG pulse delay shall be at least from 75 ns to 100 μ s. The delay is measured from the 50% point of the leading edge of the output trigger.

3.5.3.1 Pulse Delay Uncertainty. The pulse delay uncertainty of the PG shall not exceed $\pm 5\%$ of programmed value ± 5 ns.

3.5.3.2 Resolution. The pulse delay resolution shall be at least 3 digits.

3.5.3.3 Maximum Jitter. The pulse delay jitter shall not exceed 0.2% of programmed value + 100ps.

3.5.4 Double Pulse. The PG shall have the capability of double pulse with a range of 20ns to 1ms.

3.5.4.1 Double Pulse Uncertainty. The double pulse uncertainty of the PG shall not exceed $\pm 5\%$ of programmed value ± 2 ns.

3.5.4.2 Resolution. The double pulse resolution shall be at least 3 digits.

3.5.4.3 Maximum Jitter. The double pulse jitter shall not exceed 0.2% of programmed value + 100ps.

3.5.5 Duty Cycle. The duty cycle of the PG shall be at least from 1% to 99%.

3.5.6 Output Amplitude. The output amplitude of the PG shall be at least from 100 millivolts to 16 volts.

3.5.6.1 Amplitude Uncertainty. The amplitude uncertainty of the PG shall not exceed $\pm 1\%$ of programmed value $\pm 3\%$ of amplitude ± 40 mV.

3.5.6.2 Amplitude Resolution. The amplitude resolution of the PG shall be at least 3 digits at minimum 10mV.

3.5.6.3 Settling Times. The settling time of pulse amplitude shall not exceed 100ns plus transition time.

3.5.6.4 Overshoot, Preshoot, Ringing. The overshoot, preshoot, and ringing of the PG pulse shall not exceed $\pm 5\%$ of amplitude $\pm 10\text{mV}$ for linear and sinusoidal transitions; 10% of amplitude $\pm 10\text{mV}$ for fixed transitions.

3.5.6.5 Source Impedance. The PG shall have a source impedance of 50 ohms $\pm 5\%$.

3.5.7 Transition Times. The PG pulse shall have a minimum transition times of less than 10ns from 10% to 90% of amplitude, leading and trailing edges.

3.5.8 External Input. The PG shall have an input for external trigger signals.

3.5.8.1 Levels. The PG shall respond to trigger levels of -10 volts to +10 volts.

3.5.8.2 Maximum Input. The PG external trigger input shall not be damaged by input levels of ± 30 volts.

3.5.8.3 Trigger Input Sensitivity. The trigger input sensitivity of the PG shall be at least 500 mV peak-to-peak.

3.5.8.4 Impedance. The PG's input trigger impedance shall be at least 10,000 ohms.

3.5.8.5 Minimum Trigger Pulse Width. The PG shall be able to trigger on a minimum pulse width of 10ns.

3.5.9 Trigger Output.

3.5.9.1 Output Trigger Levels. The output trigger level of the PG shall be at least 2.4 volts. The trigger output impedance shall be 50 ohms.

3.5.9.2 Trigger Delay. The delay from trigger input to trigger output shall be at least 25ns.

3.5.10 Manual Controls. The PG shall have front panel controls to set the pulse; period, width, delay, and double pulse mode. The PG shall have front panel controls to select positive slope or negative slope.

3.5.11 Displays. The PG shall have front panel displays to show the parameter being set, the value of parameter, and the unit of parameter. The PG front panel shall have a remote operation indication.

3.5.12 Connectors. The PG shall have BNC-female connectors mounted on the front panel for the external trigger input, internal trigger output and pulse output.

3.6 GPIO Capabilities. The PG shall have an IEEE-488.1 interface connector with the following capabilities:

- a. SH1 - Source handshake, complete capability.
- b. AH1 - Acceptor handshake, complete capability.
- c. T6 or T5 - Talker function, complete capability.
- d. L4 or L3 - Listener function, complete capability, including Listen Only mode.
- e. SR1 - Service request, complete capability.
- f. RL1 - Remote local, complete capability.
- g. DC1 - Device clear, complete capability.
- h. E2 or E1 - Driver electronic, open circuit driver.
- i. DT1 - Device trigger, complete capability.

3.6.1 Compatibility. The PG shall be tested for compatibility with the IEEE-488 bus and the John Fluke Model 1722A/AP instrument controller.

3.7 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.7.1 Calibration Procedure. The manual shall provide a generator calibration procedure in accordance with MIL-M-38793.